

NASA TECH BRIEF

Manned Spacecraft Center



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Unified Hatch System

A special hatch sealing mechanism design (Fig. 1) provides increased safety, reliability, and convenience. Although highly sophisticated, adaptations should be possible for oceanographic and high-speed aircraft design, or for any system where a quick-opening pressure hatch is required.

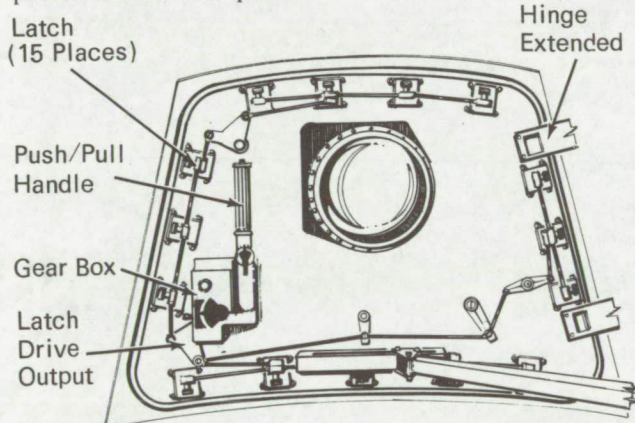


Figure 1. Unified Hatch in Open Position

In the normal mode, the hatching mechanism may be manually operated from either side. Emergency egress is accomplished by manually operating the mechanism from inside the vehicle, with a boost-assist mechanism aiding the operation.

In operation (Fig. 2), the push-pull handle is stroked five times, the push stroke being the working stroke for opening the 15 latches. The push-pull handle is linked to the latches by a ratchet assembly coupled through a gear box. Once the latches are opened, the lock-pin knob is removed and a gas-powered piston/bell crank pushes the hatch open. The door is moved 10.16 cm (4 in) away from the structure of the vehicle before being swung open

for immediate egress. A screwjack attachment is included for emergency hatch closure and retention.

The unified hatch contains the following mechanical components: latches to retain the hatch in the closed position; a linkage to transmit motion to the latches; a manually operated gearbox to drive the linkage; a plunger mechanism to open the boost protective cover hatch latches (the boost protective cover striker plunger); a gas powered piston/bell crank to push the hatch open and attenuate the travel (the counterbalance); a manually operated valve to equalize pressure across the hatch; and a screwjack attachment for emergency hatch closure and retention.

Fifteen latches are spaced at approximately 13.97 cm (5-1/2-inch) intervals around the periphery of the hatch. Each latch consists of a driving lever, a connecting lever, and a driven lever assembled in a housing secured to the inner surface of the hatch. Shims under the housings enable them to be rigged for equal distribution of seal squeeze load; and a gaging surface machined into each housing simplifies adjusting for the correct amount of over-center travel of the latch driving lever. The latch driving linkage is a simple push-pull rod system with threaded adjustments for each latch. The function of the gearbox is to open and close the hatch latches and to provide a drive for emergency opening of the boost protective cover hatch latches.

One control knob, mounted on the handle, engages either one of two pawls which control the advance direction of the ratchet wheel. The other selector knob, mounted on the gearbox housing, similarly engages pawls which prevent the ratchet wheel from backing off during the idling stroke of the push-

(continued overleaf)

pull handle. The arrangement of the pawls is such that the handle push stroke is the working stroke for opening the latches, and the pull stroke for closing them. A secondary set of pawls reduces backlash between the handle and ratchet wheel and provides a redundant safety feature.

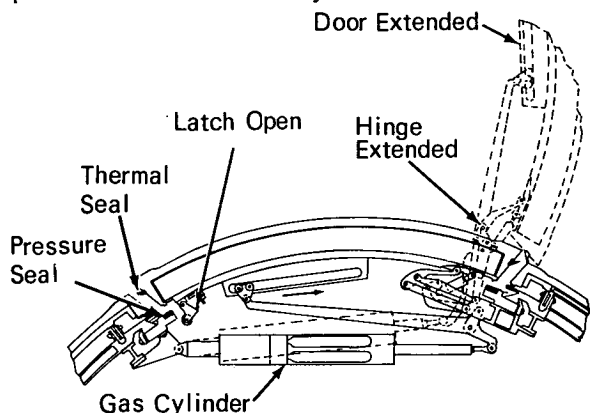


Figure 2. Hatch Hinge Mechanism

A safety locking pin is spring loaded to lock into a matching hole in the segment gear at the end of the latch closing cycle, preventing accidental

opening of the hatch due to vibration or human error. For normal (i.e., non-emergency) hatch opening, the locking pin is manually disengaged before the gearbox handle is operated. When using the exterior input, the shaft is rotated $\pi/12$ rad (15 degrees) clockwise before being rotated counterclockwise to unlatch the hatch.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Manned Spacecraft Center, Code JM7
Houston, Texas 77058
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No patent action is contemplated by NASA.

Source: Louis J. Walkover, Raymond J. Hart,
and Edward W. Zosky of
North American Rockwell Corp.
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